
RULE 4624 TRANSFER OF ORGANIC LIQUID (Adopted April 11, 1991; Amended September 19, 1991; Amended May 21, 1992; Amended December 17, 1992; Amended December 20, 2007; Amended [*rule adoption date*])

1.0 Purpose

The purpose of this rule is to limit Volatile Organic Compound (VOC) emissions from the transfer of organic liquids.

2.0 Applicability

This rule shall apply to organic liquid transfer facilities as defined in this rule.

3.0 Definitions

3.1 APCO: as defined in Rule 1020 (Definitions).

3.2 API: American Petroleum Institute.

3.3 ARB: The California Air Resource Board.

3.4 ASTM: American Society for Testing and Materials.

3.5 Background: the ambient concentration of organic compounds determined at least two (2) meters upwind from any valve or flange to be inspected and which is uninfluenced by any specific emission permit unit.

3.6 Bottom Loading: a type of organic liquid loading operation where the discharge opening into the container is completely submerged below the level of the organic liquid in the container.

3.7 CFR: Code of Federal Regulations.

3.8 Class 1 Organic Liquid Transfer Facility: any location transferring 20,000 gallons or more on any one day of organic liquids with a TVP of 1.5 psia or greater to or from tank trucks, trailers, or railroad tank cars.

3.9 Class 2 Organic Liquid Transfer Facility: any location transferring 4,000 gallons or more but less than 20,000 gallons on any one day of organic liquids with a TVP of 1.5 psia or greater to or from tank trucks, trailers, or railroad tank cars.

3.10 Closed VOC Emission Control System: an APCO-approved VOC emission control system that is not open to the atmosphere and that is composed of hard-piping, ductwork connections, and, if necessary, flow inducing devices that transport collected gases or vapors from a piece or pieces of equipment to a vapor return system or condensation system that connects to a process stream, a gas processing

plant, a gas pipeline recovery and distribution system (sales gas system), a fuel gas system, or an injection well for disposal of vapors as approved by the ~~Department of Oil, Gas, and Geothermal Resources (DOGGR)~~ California Geologic Energy Management Division (CalGEM).

- 3.11 Component: includes, but is not limited to, any valve, fitting, threaded connection, pump, compressor, pressure relief device, pipe, flange, process drain, sealing mechanism, sight-glass, meter, or seal fluid system, separators, and pressure vessels in VOC service.
- 3.142 Container: any stationary tank, reservoir, or vessel in which any organic liquid is placed, held, or stored.
- 3.123 EPA: United States Environmental Protection Agency.
- 3.134 Excess Organic Liquid Drainage: more than ten (10) milliliters liquid drainage. Such liquid drainage for disconnect operations shall be determined by computing the average drainage from three consecutive disconnects at any one permit unit.
- 3.145 Gasoline: any petroleum distillate, petroleum distillate/alcohol blend or alcohol having a Reid vapor pressure of four (4) pounds per square inch absolute or greater, which is used as a motor vehicle fuel, or any fuel which is commonly or commercially known or sold as gasoline.
- 3.156 Gasoline Bulk Plant: any loading facility and associated unloading facilities, storage tanks and vapor recovery system(s) used to load less than 20,000 gallons in any one (1) day of gasoline to delivery vessels (i.e., tank trucks or trailers).
- 3.167 IBP: Initial Boiling Point.
- 3.18 Inaccessible Component: a component that is located over 15 feet above ground when access is required from the ground; or a component that is located over six (6) feet away from a platform when access is required from the platform, or a component in a location that would require the elevation of monitoring personnel higher than six (6) feet above permanent support surfaces.
- 3.179 Leak: the dripping of VOC-containing liquid at a rate of more than three (3) drops per minute; or
- 3.179.1 For organic liquids other than gasoline, ~~the detection~~ a reading in excess of the value specified in Table 1 or Table 2 of any gaseous or vapor emissions a concentration of VOC greater than 1,000 ppmv above a background as methane, above background on a portable hydrocarbon detection instrument when measured in accordance with the test method in Section 6.3.8 that exceeds the values specified in Table 1 or Table 2. shall constitute a leak.

<u>Table 1 Leak in ppmv as Methane (Until June 30, 2024)</u>	
	<u>Leak</u>
<u>Component</u>	<u>1,000 and greater</u>

<u>Table 2 Leak in ppmv as Methane (After June 30, 2024)</u>		
	<u>Major Leak</u>	<u>Minor Leak</u>
<u>Component</u>	<u>1,000 and greater</u>	<u>500 to less than 1,000</u>

3.179.2 For gasoline, a concentration of VOC greater than 10,000 ppmv, as methane, above background when measured in accordance with the test method in Section 6.3.8 shall constitute a leak.

3.179.3 Any liquid or gas coming from a component undergoing repair or replacement, or during sampling of process fluid from equipment into a container is not considered a leak provided such activities are accomplished as expeditiously as possible and with minimal spillage of material and VOC emissions to the atmosphere.

3.1820 Location: any single site at a building, structure, facility, or installation.

3.1921 Normal Business Hours: Monday through Friday, 8:00 am to 5:00 pm.

3.22 Optical Gas Imaging (OGI): an instrument that makes emissions visible that may otherwise be invisible to the naked eye.

3.2023 Organic Liquid: any liquid which contains VOCs and has a TVP of 1.5 psia or greater at the storage container’s maximum organic liquid storage temperature. Clean produced water, as defined by Rule 1020, and other types of liquids that contain no more than 35 milligrams of VOC per liter, shall not be considered to be an organic liquid.

3.2124 Organic Liquid Loading Operation: the transfer of organic liquid to a tank truck, trailer, or railroad car.

3.2225 Organic Liquid Transfer Facility: any aggregate or combination of transfer racks and vapor control equipment at a location, including, but not limited to, the stationary organic liquid pump, and the hose end connector, and the discharge of the vapor control device(s).

3.2326 Portable Hydrocarbon Detection Instrument: a hand-held hydrocarbon analyzer that meets the criteria specified in EPA Method 21, 40 CFR Part 60. The instrument shall be calibrated with methane.

3.27 Process Drain: any open portion of a non-continuous piping system, including open origination portion(s) of such a system used for collection and transport of liquids discharged from process vessels, spills, or other sources.

3.2428 Psia: Pounds per square inch, absolute.

3.259 Pump: a device used to transport fluids by the addition of energy, and includes all associated components used for connecting or sealing purposes. The phrase "all associated components used for connecting and sealing purposes" means the first VOC leak points (first components) on the body of the pump. For example, a valve that is connected to a threaded hole on body of the pump, the first VOC leak point is the threaded connection on the body side of the pump, but the valve itself is not a "first VOC leak point". Similarly, a pump shaft seal is considered as a first "VOC leak point".

3.30 Tag: a piece of paper, metal, plastic or other suitable material that is attached to a component for the purpose of identification or other information.

3.2631 Transfer Rack: a loading rack as defined in Rule 1020 (Definitions) or an unloading rack as defined in Rule 2020 (Exemptions). This rule applies only to racks with stationary pumps.

3.2732 ~~TVP~~: True Vapor Pressure (TVP): the equilibrium partial vapor pressure exerted by an organic liquid at actual storage temperature as determined by the applicable test methods specified in Section 6.3.

3.33 Unsafe-to-Monitor Component: a component installed at a location that would prevent the safe inspection or repair of a component as defined by OSHA standards or in provisions for worker safety stated in 29 CFR 1910.

3.2834 Volatile Organic Compound (VOC): as defined in Rule 1020 (Definitions).

4.0 Exemptions

4.1 The requirements of Section 5.0 of this rule shall not apply to organic liquid transfer facilities which transfer less than 4,000 gallons of organic liquids ~~in any one day~~ daily. The operator shall meet the applicable recordkeeping requirements of Section 6.1.1.

4.2 The requirements of this rule shall not apply to transfer operations subject to the requirements of Rule 4621 (Gasoline Transfer into Stationary Storage Containers, Gasoline Delivery Vessels and Gasoline Bulk Plants) or to transfer operations that are subject to Rule 4622 (Gasoline Transfer into Motor Vehicle Fuel Tanks).

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- 4.3 Except for Section 6.1, the requirements of this rule shall not apply to the transfer of organic liquids with TVP less than 1.5 psia at the storage container's maximum organic liquid storage temperature.
- 4.4 The requirements of Section 5.9 shall not apply to equipment or components subject to:
- 4.4.1 Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities);
 - 4.4.2 Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants); or
 - 4.4.3 Rule 4623 (Storage of Organic Liquids).
- 4.5 Except for the one-time record submission requirement of Section 6.1.5 for vacuum truck operators, the requirements of this rule shall not apply to transfer operations involving vacuum trucks.
- 5.0 Requirements
- 5.1 For a Class 1 organic liquid transfer facility, the emission of VOC from the transfer operation shall not exceed 0.08 pounds per 1,000 gallons of organic liquid transferred and use one of the following systems:
- 5.1.1 An organic liquid loading operation shall be bottom loaded.
 - 5.1.2 The VOC from the transfer operation shall be routed to:
 - 5.1.2.1 A vapor collection and control system;
 - 5.1.2.2 A fixed roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids);
 - 5.1.2.3 A floating roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or
 - 5.1.2.4 A pressure vessel equipped with an APCO-approved vapor recovery system that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or
 - 5.1.2.5 A closed VOC emission control system.
- 5.2 A Class 2 organic liquid transfer facility shall prevent the release to the atmosphere of at least 95 percent by weight of the VOC displaced during organic liquid transfers and use one of the following systems:

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- 5.2.1 An organic liquid loading operation shall be bottom loaded, equipped with a vapor collection and control system and the vapors from loading the tank truck, trailer, or railroad tank car shall be routed to the vapor collection and control system; or
- 5.2.2 The VOC from the transfer operation shall be routed to:
- 5.2.2.1 A vapor collection and control system; or
 - 5.2.2.2 A fixed roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or
 - 5.2.2.3 A floating roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or
 - 5.2.2.4 A pressure vessel equipped with an APCO-approved vapor recovery system that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or
 - 5.2.2.5 A closed VOC emission control system.
- 5.3 A transfer operation utilizing a closed VOC emission control system or utilizing a container that meets the control requirements of Rule 4623 (Storage of Organic Liquids) to meet the emission control requirements of this rule shall demonstrate compliance with Sections 5.1 and 5.2 by complying with the leak inspection requirements of Section 5.9.
- 5.4 The vapor collection and control system shall operate such that the pressure in the delivery tank being loaded does not exceed 18 inches water column pressure and six (6) inches water column vacuum. This section shall not apply to the transfer of liquefied petroleum gas.
- 5.5 All delivery tanks which previously contained organic liquids with a TVP of 1.5 psia or greater at the storage container's maximum organic liquid storage temperature shall be filled only at transfer facilities satisfying Sections 5.1, 5.2, or 5.4, as applicable.
- 5.6 The transfer rack and vapor collection equipment shall be designed, installed, maintained and operated such that there are no major leaks and no excess organic liquid drainage at disconnections.
- 5.7 The construction of any new top loading facility or the reconstruction, as defined in 40 CFR 60.15, or the expansion of any existing top loading facility with top loading equipment shall not be allowed.

5.8 Notwithstanding any other provision of this rule, organic liquid transfer facilities exclusively handling liquefied petroleum gas need not comply with the bottom loading provisions of Sections 5.1, 5.2 or 5.7, provided the operator complies with the emission limit of Section 5.1, 5.2 and the provisions of Section 5.6.

5.9 Leak Inspection Requirements

5.9.1 The operator of an organic liquid transfer facility shall inspect the vapor collection system, the vapor disposal system, and each transfer rack handling organic liquids for leaks during transfer at least once every calendar quarter using the test method prescribed in Section 6.3.8.

5.9.2 A floating roof container that meets the applicable control requirements of Section 5.0 of Rule 4623 (Storage of Organic Liquids) shall be considered not leaking for the purposes of this section.

5.9.3 All equipment that are found leaking shall be repaired or replaced within 72 hours. If the leaking component cannot be repaired or replaced within 72 hours, the component shall be taken out of service until such time the component is repaired or replaced. The repaired or replacement equipment shall be reinspected the first time the equipment is in operation after the repair or replacement.

<u>Table 3 Repair Time Periods</u>	
<u>Type of Leak</u>	<u>Repair Time Period</u>
<u>Liquid Leak</u>	<u>72 hours</u>
<u>Gas Leak</u>	<u>72 hours</u>

5.9.4 ~~Until June 30, 2024,~~ An operator may apply for a written approval from the APCO to change the inspection frequency from quarterly to annually provided no leaks were found during the inspections required under provisions of Sections 5.9.1 and 5.9.2 during five consecutive quarterly inspections. Upon identification of any leak during an annual inspection the frequency would revert back to quarterly and the operator shall contact the APCO in writing within 14 days.

5.9.5 After June 30, 2024, an operator is in violation if exceeding the allowable number of leaks during a District inspection as defined in Table 4 and 5.9.5.1.

<u>Table 4 Number of Allowable Leaks after June 30, 2024</u>	
<u>Minor leaks</u>	<u>2.0% of number inspected</u>
<u>Major leaks</u>	<u>0</u>

*The maximum number of leaks in Table 4 shall be rounded upwards to the nearest integer, where required. The maximum allowable percent of

leaks are calculated from the total number of components inspected during the specified inspection period. Leaks counted towards the allowable leaks in Table 4 are still subject to the repair requirements of section 5.9.3.

5.9.5.1 Failure to repair leaks within the timeframes specified in Table 3.

5.9.6 Except for inaccessible components and unsafe to monitor components, owners or operators shall audio-visually inspect (by hearing and by sight) all hatches, pressure-relief devices, and pump seals for leaks or indications of leaks at least once every 24 hours for facilities that are visited daily, or at least once per calendar week for facilities that are not visited at least once every 24 hours; and,

5.9.6.1 Owners or operators shall audio-visually inspect all pipes for leaks or indications of leaks at least once every 12 months.

5.9.7 Any audio-visual inspection specified in Section 5.9.6 that indicates a leak shall be tested using US EPA Reference Method 21 within 24 hours, and the leak shall be repaired in accordance with the repair timeframes specified in Section 5.9.3.

5.10 Maintenance Requirements

5.10.1 Upon detection of a leaking component, the operator shall affix to that component a weatherproof readily visible tag.

5.10.2 The tag shall remain affixed to the component until all the conditions specified in Sections 5.10.2.1 through 5.10.2.3 have been met.

5.10.2.1 The leaking component has been successfully repaired or replaced; and,

5.10.2.2 The component has been re-inspected using the test method in Section 6.3.8; and

5.10.2.3 The component is found to be in compliance with the requirements of this rule.

5.10.3 The tag shall include the following information:

5.10.3.1 Date and time of leak detection; and

5.10.3.2 Date and time of leak measurement; and

5.10.3.3 For gaseous leaks, indicate the leak concentration in ppmv; and

5.10.3.4 For liquid leaks, the dripping rate of the liquid.

6.0 Administrative Requirements

6.1 Recordkeeping

- 6.1.1 An operator claiming exemption under Section 4.1 shall keep records of daily liquid throughput.
- 6.1.2 An operator claiming exemption under Section 4.3~~2~~ of this rule shall maintain accurate daily records of liquid TVP.
- 6.1.2.1 Liquid TVP shall be determined using Appendix A or the applicable test method in Section 6.3.
- 6.1.2.2 The TVP shall be determined whenever there is a change in the type of liquid being transferred.
- 6.1.2.3 An operator may use a material safety data sheet (MSDS) in place of TVP testing if the transferred organic liquid is not crude oil or a petroleum distillate.
- 6.1.3 An operator subject to any part of Section 5.0 shall keep records of daily liquid throughput and the results of any required leak inspections.
- 6.1.4 Records required under Sections 6.1.1, 6.1.2, 6.1.3 shall be retained for a minimum of five years and shall be made readily available to the APCO, ARB, ~~or~~ and EPA during normal business hours and submitted upon request to the APCO, ARB, or EPA.
- 6.1.5 By July 1, 2008, operators of vacuum trucks claiming exemption under Section 4.5 shall submit to the District records covering 12 consecutive months of operation. The records shall indicate all of the following:
- 6.1.5.1 The number of vacuum trucks in operation;
- 6.1.5.2 The capacity of each vacuum truck storage container;
- 6.1.5.3 The average monthly throughput per vehicle;
- 6.1.5.4 The type of organic liquid transferred; and
- 6.1.5.5 The VOC capture and control equipment utilized.

6.1.6 Inspection Log

The operator shall maintain an inspection log containing, at a minimum, all of the following information:

6.1.6.1 Total number of components inspected, and total number and percentage of leaking components found during inspection.

6.1.6.2 Location, type, name or description of each leaking component and description of any unit where the leaking component is found.

6.1.6.3 Date of leak detection and method of leak detection.

6.1.6.4 For gaseous leaks, record the leak concentration in ppmv, and for liquid leaks record the volume.

6.1.6.5 Date of repair, replacement, or removal from operation of leaking components.

6.1.6.6 After the component is repaired or is replaced, the date of re-inspection and the leak concentration in ppmv.

6.1.6.7 Inspector's name, business mailing address, and business telephone number.

6.1.6.8 The facility operator responsible for the inspection and repair program shall sign and date the inspection log certifying the accuracy of the information recorded in the log.

6.1.6.9 Records of each calibration of the portable hydrocarbon detection instrument utilized for inspecting components, including a copy of current calibration gas certification from the vendor of said calibration gas cylinder, the date of calibration, concentration of calibration gas, instrument reading of calibration gas before adjustment, instrument reading of calibration gas after adjustment, calibration gas expiration date, and calibration gas cylinder pressure at the time of calibration.

6.1.6.10 Copies of all records required by Section 6.1 of this rule shall be retained for a minimum of five (5) years after the date of an entry, and the records shall be made available to the APCO, ARB, and US EPA upon request.

6.2 Compliance Testing

6.2.1 By July 20, 2009, the operator of any Class 1 or Class 2 organic liquid transfer facility shall perform an initial source test of the VOC emission control system in accordance with the method prescribed in Section 6.3.2 to determine compliance with Section 5.1 and 5.2, as applicable.

6.2.1.1 Facilities in existence prior to December 20, 2007, that have performed the test specified in Section 6.3.2 within the 60 month period preceding December 20, 2007, need not perform an initial source test.

6.2.1.2 The source testing requirements of Section 6.2.1 shall not apply to any Class 1 or Class 2 organic liquid transfer facility equipped with a closed VOC control system.

6.2.1.3 The source testing requirements of Section 6.2.1 shall not apply to any Class 1 or Class 2 organic liquid transfer facility controlling VOC by routing vapors to:

6.2.1.3.1 A fixed roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or

6.2.1.3.2 A floating roof container that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids); or

6.2.1.3.3 A pressure vessel equipped with an APCO-approved vapor recovery system that meets the control requirements specified in Rule 4623 (Storage of Organic Liquids).

6.2.2 The operator of any Class 1 or Class 2 organic liquid transfer facility shall perform the source test specified in Section 6.3.2 once every 60 months, but no more than 30 days before or after initial source test anniversary date.

6.3 Test Methods

6.3.1 Analysis of halogenated exempt compounds shall be by ARB Method 432.

6.3.2 Compliance with Sections 5.1 and 5.2 shall be determined using 40 CFR 60.503 "Test Methods and Procedures" and EPA Methods 2A, 2B, 25A and 25B and ARB Method 422, or ARB Test Procedure TP-203.1.

- 6.3.3 The TVP of any organic liquid shall be determined by measuring the Reid Vapor Pressure (RVP) using ASTM D 323 (Test Method for Vapor Pressure for Petroleum Products), and converting the RVP to TVP at the storage container's maximum organic liquid storage temperature. The conversion of RVP to TVP shall be done in accordance with the procedures in Appendix B. Appendix B is an excerpt from the oil and gas section of "ARB Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588", dated August 1989.
- 6.3.4 As an alternative to using ASTM D 323, the TVP of crude oil with an API gravity range of greater than 26 degrees up to 30 degrees may be determined by using other equivalent test methods approved by APCO and EPA.
- 6.3.5 The latest version of the Lawrence Berkeley National Laboratory "Test Method for Vapor Pressure of Reactive Organic Compounds in Heavy Crude Oil Using Gas Chromatograph", as approved by ARB and EPA, shall be used to determine the TVP of crude oil with an API gravity of 26 degrees or less, or for any API gravity that is specified in this test method.
- 6.3.6 An operator may use the information in Appendix A to determine the TVP of the stored organic liquid in a tank provided the storage temperature listed in Appendix A is not exceeded at any time.
- 6.3.7 The API gravity of crude oil or petroleum distillate shall be determined using ASTM Method D 287 (Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)). Sampling for API gravity shall be performed in accordance with ASTM Method D 4057 (Standard Practices for Manual Sampling of Petroleum and Petroleum Products).
- 6.3.8 Compliance with facility leaks as defined in Section 3.0 shall be determined using a portable hydrocarbon detection instrument in accordance with EPA Method 21.
- 6.3.8.1 After June 30, 2024, All leaks detected with the use of an OGI instrument shall be measured using EPA Reference Method 21 within two (2) calendar days of initial OGI leak detection or within 14 calendar days of initial OGI leak detection of an inaccessible or unsafe to monitor component to determine compliance with the leak thresholds and repair timeframes specified in Table 3.
- 6.3.9 An alternative test method may be used if the alternative is approved in writing by the APCO and EPA.

6.4 Version of Test Methods

All ASTM test methods referenced in Section 6.0 are the most recently EPA-approved version that appears in the CFR as Materials Approved for Incorporation by Reference.

7.0 Compliance Schedule

~~7.1 Operators of transfer facility subject to this rule on or before December 20, 2007, shall be in full compliance with all applicable rule requirements on and after December 20, 2008, unless otherwise specified in the rule.~~

~~7.2 The owner or operator of any transfer facility which is subject to the requirements of this rule and which was installed or constructed after December 20, 2007, shall be in full compliance with the requirements of this rule upon initial operation.~~

7.3 Any organic liquid transfer facility that is exempt pursuant to Section 4.1, 4.2, and 4.3 that becomes subject to the requirements of this rule through loss of exemption shall not be operated until such time that it is in full compliance with the requirements of this rule.

Appendix A

STORAGE TEMPERATURE VERSUS VAPOR PRESSURE

ORGANIC LIQUID	Reference Properties		Maximum Temp °F Not to Exceed
	Gravity °API	IBP °F	1.5 (psia)
Middle Distillates			
Kerosene	42.5	350	250
Diesel	36.4	372	290
Gas Oil	26.2	390	310
Stove Oil	23	421	340
Jet Fuels			
JP-1	43.1	330	230
JP-3	54.7	110	25
JP-4	51.5	150	68
JP-5	39.6	355	260
JP-7	44-50	360	260
Fuel Oil			
No. 1	42.5	350	250
No. 2	36.4	372	290
No. 3	26.2	390	310
No. 4	23	421	340
No. 5	19.9	560	465
Residual	19.27	---	---
No. 6	16.2	625	---
Asphalts			
60-100 pen.	---	---	550
120-150 pen.	---	---	500
200-300 pen.	---	---	420

IBP = Initial Boiling Point

Appendix B

California Air Resources Board Technical Guidance
to the Criteria and Guidelines Regulation for AB 2588
(Partial Excerpt from pages 102, 103 and 104)

True Vapor Pressure (TVP)

RVP is the absolute pressure of volatile crude oil and nonviscous petroleum liquids. Numerically, the relationship between TVP, RVP and temperature can be expressed by the following equation:

$$\text{TVP} = (\text{RVP}) e^{[C_o(\text{IRTEMP} - \text{ITEMP})]}$$

Where: C_o = Constant dependent upon the value of RVP
 $\text{ITEMP} = (1/559.69^\circ\text{R})$
 $\text{IRTEMP} = (1/(\text{T}_s + 459.69^\circ\text{R}))$
 T_s = Temperature of the stored fluid in °F

The value of the constant term C_o depends upon the given value of RVP.

Values of C_o for different RVP numbers are tabulated in Table C-3. It should be noted, however, that an error was discovered in the API nomograph calculated values of TVP so that the RVP was not equal to TVP at 100°F as was expected given the general definition of RVP. Using linear regression techniques, correction factors (C_F) were developed and should be added to the calculated values of TVP in order to obtain reasonable TVP numbers. The relationship between the three values is given as follows:

$$\text{Corrected TVP} = \text{Calculated TVP} + C_F$$

The correction factor was found to be dependent upon RVP according to the following equations:

If $\text{RVP} < 3$,

$$C_F = (0.04) \times (\text{RVP}) + 0.1$$

If $\text{RVP} > 3$,

$$C_F = e^{[2.3452061 \log (\text{RVP}) - 4.132622]}$$

Appendix B (Continued)

Table C-3 VALUES OF C_o FOR DIFFERENT RVP NUMBERS

RVP	C_o
0<RVP<2	-6622.5
2<RVP<3	-6439.2
RVP = 3	-6255.9
3<RVP<4	-6212.1
RVP = 4	-6169.2
4<RVP<5	-6177.9
RVP = 5	-6186.5
5<RVP<6	-6220.4
RVP = 6	-6254.3
6<RVP<7	-6182.1
RVP = 7	-6109.8
7<RVP<8	-6238.9
RVP = 8	-6367.9
8<RVP<9	-6477.5
RVP = 9	-6587.9
9<RVP<10	-6910.5
RVP = 10	-7234.0
10<RVP<15	-8178.0
RVP > 15	-9123.2